

Appin No. 10/728,780
Amdt. Dated June 9, 2006
Response to Office Action of April 4, 2006

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An ink jet printhead comprising:
a plurality of nozzles;
a bubble forming chamber corresponding to each of the nozzles respectively, the bubble forming chambers adapted to contain a bubble forming liquid; and,
at least one heater associated with each of the bubble forming chambers respectively, the heater having electrodes for connection to a power supply and heater elements configured for thermal contact with the bubble forming liquid; such that,
heating the heater element above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection a drop of ejectable liquid from the nozzle;
wherein the heater element is supported within the bubble forming chamber by the electrodes such that it does not contact the bubble forming chamber and so that a distance between a collapse point of the gas bubble and the nozzle is less than 5 microns.
2. (Original) The printhead of claim 1 wherein the electrodes are positioned adjacent each other on one side of the bubble forming chamber and the heater element is cantilevered within the chamber.
3. (Original) The printhead of claim 1 wherein the heater element extends across the bubble forming chamber between opposing the electrodes
4. (Original) The printhead of claim 1 wherein the bubble forming chamber has a circular cross section and the heater element has arcuate sections that are concentric with the circular cross section.
5. (Original) The printhead of claim 1 wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.
6. (Original) The printhead of claim 1 being configured to print on a page and to be a page-width printhead.

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7. (Original) The printhead of claim 1 wherein each heater element is in the form of a cantilever beam.

8. (Original) The printhead of claim 1 wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.

9. (Cancelled).

10. (Original) The printhead of claim 1 comprising a substrate having a substrate surface, wherein the areal density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface.

11. (Original) The printhead of claim 1 wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element.

12. (Currently Amended) The printhead of claim 1 wherein ~~the bubble which each element is configured to form is collapsible and has a point of collapse, and wherein each~~ heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

13. (Original) The printhead of claim 1 comprising a structure that is formed by chemical vapor deposition (CVD), the nozzles being incorporated on the structure.

14. (Original) The printhead of claim 1 comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure.

15. (Original) The printhead of claim 1 comprising a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another.

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16. (Original) The printhead of claim 1 wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

17. (Original) The printhead of claim 1 wherein each heater element includes solid material and is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above said boiling point thereby to heat said part of the bubble forming liquid to a temperature above said boiling point to cause the ejection of a said drop.

18. (Currently Amended) The printhead of claim 1 wherein each heater element is ~~substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless.~~

19. (Currently Amended) A printer system which incorporates a printhead, the printhead comprising:

a plurality of nozzles;

a bubble forming chamber corresponding to each of the nozzles respectively, the bubble forming chambers adapted to contain a bubble forming liquid; and,

at least one heater associated with each of the bubble forming chambers respectively, the heater having electrodes for connection to a power supply and heater elements configured for thermal contact with the bubble forming liquid; such that,

heating the heater element above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection a drop of ejectable liquid from the nozzle;

wherein the heater element is supported within the bubble forming chamber by the electrodes such that it does not contact the bubble forming chamber and so that a distance between a collapse point of the gas bubble and the nozzle is less than 5 microns.

20. (Original) The system of claim 19 wherein the electrodes are positioned adjacent each other on one side of the bubble forming chamber and the heater element is cantilevered within the chamber.

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21. (Original) The system of claim 19 wherein the heater element extends across the bubble forming chamber between opposing the electrodes.
22. (Original) The system of claim 19 wherein the bubble forming chamber has a circular cross section and the heater element has arcuate sections that are concentric with the circular cross section.
23. (Original) The system of claim 19 being configured to support the bubble forming liquid in thermal contact with each said heater element, and to support the ejectable liquid adjacent each nozzle.
24. (Original) The system of claim 19 wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.
25. (Original) The system of claim 19 being configured to print on a page and to be a page-width printhead.
26. (Original) The system of claim 19 wherein each heater element is in the form of a cantilever beam.
27. (Original) The system of claim 19 wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.
28. (Cancelled).
29. (Original) The system of claim 19 comprising a substrate having a substrate surface, wherein the areal density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface.
30. (Original) The system of claim 19 wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element.

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31. (Currently Amended) The system of claim 19 wherein ~~the bubble which each element is configured to form is collapsible and has a point of collapse, and wherein each~~ heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

32. (Original) The system of claim 19 comprising a structure that is formed by chemical vapor deposition (CVD), the nozzles being incorporated on the structure.

33. (Original) The system of claim 19 comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure.

34. (Original) The system of claim 19 comprising a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another.

35. (Original) The system of claim 19 wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

36. (Original) The system of claim 19 wherein each heater element includes solid material and is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above said boiling point thereby to heat said part of the bubble forming liquid to a temperature above said boiling point to cause the ejection of a said drop.

37. (Currently Amended) The system of claim 19 wherein each heater element is ~~substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that~~ the coating is seamless.

38-54. (Cancelled)